EXAMINING GROUP 2676
PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Michael Francis Higgins	)	Group Art Unit: 2676
Application No.: 10/690,716	)	Confirmation No. 9772
Filed: October 21, 2003	)	Examiner: Luu, Matthew
For: GAMUT CONVERSION SYSTEM AND METHODS	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE TO RESTRICTION REQUIREMENT UNDER 35 U.S.C. § 121

and

AMENDMENT UNDER 37 CFR 1.111

Applicant files herewith a response, with amendment, to the Restriction Requirement included in the Office Action mailed February 6, 2006.

Amendments to the Specification begin on page 2.

Amendments to the Claims begin on page 4.

Remarks begin on page 11.

Amendments to the Specification:

Please amend paragraph [001] of the specification as follows:

[01] The present application is related to commonly owned ~~(and filed on even date)~~ United States Patent Applications: (1) United States Patent Publication No. 2005/0083345 ('the '345 application) entitled "HUE ANGLE CALCULATION SYSTEM AND METHODS"; (2) United States Patent Publication No. 2005/0083341 ('the '341 application) entitled "METHOD AND APPARATUS FOR CONVERTING FROM SOURCE COLOR SPACE TO RGBW TARGET ~~CENTER~~ COLOR SPACE"; (3) United States Patent Publication No. 2005/0083352 ('the '352 application) entitled "METHOD AND APPARATUS FOR CONVERTING FROM A SOURCE COLOR SPACE TO A TARGET COLOR SPACE", which are hereby incorporated herein by reference.

Please amend paragraph [021] of the specification as follows:

[021] In order to reduce the costs of computation, one embodiment will now be described. Since sRGB is already perceptually uniform, there is no need to convert to the computationally expensive CIE Lab. Instead, it may be desirable to convert sRGB directly into YCbCr, or some other even more computationally inexpensive conversion to separate chroma/luma. This is much easier to implement in hardware than conversion to CIE Lab. If the three-value color input happens already to be YCrCb, this is also a perceptually uniform system and can be used as they are without conversion. The same is true for most TV color-spaces, once they have been digitized, for example YPbPr, YUV and YIQ. If the source colors are linear RGB, a gamma conversion table can be used to convert them to sRGB first. Once the resulting color is in a perceptually uniform separate chroma/luma space, the hue angle may be computed. One such computationally inexpensive method of calculating the hue angle is described in the '345 application referenced above. ~~one of the aforementioned related applications.~~ Once hue angle is calculated, it is used as an index into a table of gamut expansion values. In one embodiment, the output of the expansion table could be expressed as a number between 0 and two, probably very close to one. These numbers can be represented as fixed-point binary numbers with one bit above the binary point. This allows for integer multipliers, with appropriate shifts afterwards, to be

used to implement gamut expansion as an inexpensive system. The expansion number could be used to multiply both the components of chroma -- thus, changing the saturation without effecting hue or luma.

Please amend paragraph [030] of the specification as follows:

[030] The ratios of values in these maximum saturation curves could be used to generate the final gamut conversion tables. The ratio of the CMY and sRGB values, for example, could generate a gamut conversion table that would convert sRGB values into a gamut that may be a better fit for a CMY printer. It should be noted that, at some hue angles in **FIG. 3**, the sRGB curve 302 lies below the CMY curve 304. This will result in gamut conversion values greater than one, which will increase the saturation of colors with those hue angles. It should be also noted that at some hue angles in **FIG. 3** the sRGB curve 302 lies above the CMY curve 304. This will result in gamut conversion values less than one, which will decrease the saturation of colors with those hue angles. This is the situation shown in **FIG. 4B**.

Please amend paragraph [031] of the specification as follows:

[031] The ratio of the multi-primary to sRGB maximum saturation curves in **FIG. 3,** to choose a different example, would generate a gamut conversion table that would convert sRGB values into a gamut that would better fit a 6-primary display. It should be noted that at all hue angles in Figure 3, the sRGB curve 302 lies on or below the multi-primary curve 306. This will result in gamut conversion values that are all greater than or equal to one, which will always increase the saturation of colors at all hue angles. This is the situation shown in **FIG. 4C**.

Please amend paragraph [033] of the specification as follows:

[033] However, it might be advantageous to scale all the colors between BLACK and point A. This causes all colors on line BLACK-A to be scaled, so the color at point A moves to point B in ~~FIG. 4~~ FIG. 5. Colors between point A and B would be moved inside the gamut. Colors between BLACK and point B are also moved, for example the color at point C moves to point D.